

## A STUDY OF MORTALITY AMONG UNDER-FIVE CHILDREN IN BASRAH - 2014

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### ABSTRACT

#### Background

*The under-five mortality rate (U-5 MR): is the number of Children who die by the age of five per 1000 live births per year. UNICEF classified (U-5 MR) indicators into infant mortality rate(IMR)and mortality rate for 1-4 years age children.*

*(IMR): is the annual number of deaths of children under one year of age for every 1000 live births. It has two components:*

*Neonatal Mortality Rate (NMR): is the number of infant deaths under 28 days of age in a year per 1000 live births in the same year. may be subdivided into:*

*Early neonatal deaths, occurring during the first seven days of life.*

*Late neonatal deaths, occurring after seventh day but before 28 completed days of life.*

*Post Neonatal Mortality Rate (PNMR): is the number of deaths of infants between 28 days and one year of life in a given year per 1000 live births*

*Children (1-4) years deaths: the death of children aged 1-4 years*

*Live birth: the complete extraction from the mother of a product of human conception, irrespective of the duration of pregnancy, which after such expulsion, shows any other evidence of life. (U-5 MR): is a leading indicator of the level of child health. (NMR): also reflect the health status of mothers. Causes of under-five child mortality is Acute lower respiratory tract infection mostly pneumonia, diarrhea, measles, and malaria are the leading causes of childhood deaths in developing countries. Under nutrition contribute to about 50% of these deaths.*

#### OBJECT

- *To assess the rate of mortality for children under five years old, and geographical distribution of deaths with sex and place of residence, socio demographic factors in Basra governorate-2014.*
- *To know the main causes of death.*
- *To put advice to reduce rat of mortality, and recommendations for future and better care in Basrah.*

**MATERIALS AND METHODS**

*This study is a record based cross-sectional study, which derived its data from death certificates for children less than five years of age in Basrah-2014. The data include age and sex, cause of death, place of death, then data analysis and classification.*

**RESULTS**

*The mortality rate(U-5MR) and number of under five children in Basrah-2014 was 24.5 per 1000 live births, 2619 (respectively) in this study, while total number of deaths were 11372 for the whole population in Basrah, the neonatal mortality rate (NMR) was 16.7, post neonatal mortality rate (PNMR) and 1-4 year child mortality rates were 4.6 & 3.1 per 1000 live births respectively, infant mortality rates (IMR) were 21.3 per 1000 live births, the highest mortality rates were recorded in Al- Hartha and Shat-Al-Arab districts, while in Al-Fao district show the highest PNMR. Lowest mortality rates estimated by the study in Basrah city center, Al-Qurna, and Al-Medainah. At the first 7 days of neonatal period most of these infant deaths occurred.*

*Commonest cause of deaths at infant and neonatal period was RDS and prematurity. While infection was the main cause of deaths at late neonatal periods, and injuries was the most common cause of (1-4 year) mortality rate of children.*

**CONCLUSIONS**

*Children are the future of every nation, Mortality usually reflects community's major health problems. In the present study the overall under five and infant mortality rates were 24.5 and 21.3 /1000 live births respectively. These rates are higher than those reported for the neighboring countries (Iran, Turkey, and Jordan), and they are many times higher than those reported in the Gulf countries (Kuwait, United Arab Emirates and Bahrain), while they are very much lower than those reported for Pakistan and Sudan. A household study on infant mortality carried out in two areas in Basrah (Hay Al- Hussein & Hay- Al- Jazzier) for the period 1985 – 1989 the overall IMR was 41.7/1000 L.B, which was higher than those reported for Basrah and the whole country at 32.2 and 26.1/1000 L.B respectively in the same period. A same study was carried out to study under five mortality in Basrah at 2004, the under-five mortality and infant mortality were 27.3 and 24 per 1000 live births respectively. Descriptive retrospective study carried out in Basrah for the period from 2008-2013 depending on the data obtained from statistical unit of Basrah directorate of health, infant mortality rate was 22.4/1000 L.B*

**KEYWORDS:** Basrah 2014, Under Five Mortality Rate, Basrah Governorate, Infant Mortality Rate, Al-Fao District, Al-Qurna, Deaths from RDS and Prematurity & Al- Hartha and Shat-Al-Arab Districts

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**SUMMARY**

This study is a record based **cross-sectional study**, which derived its data from death certificates for children less than five years of age in **Basrah-2014**. The objectives of the study were to estimate **under-five childhood** mortality rate for Basrah Governorate for the studied year, to study the distribution of these deaths by gender and their geographical distribution within the governorate, also to study their common causes. A total of 11372 deaths were registered in Basrah for the whole population, 2619 of them were children less than five years which were involved in the study in Basrah during the year 2014. The estimated under five and infant mortality rates were 24.5 & 21.3 per 1000 live births respectively, the neonatal mortality rate was 16.7, post neonatal mortality rate and 1-4 year child mortality rates were 4.6 & 3.1 per 1000 live births respectively. Distinct differences between the two sexes were observed for all the rates estimated by the study; infant, neonatal, early neonatal, post neonatal and 1-4 year mortality rates. In addition mortality differs markedly from one

area to another, the highest mortality rates were estimated in Al- Hartha and Shat-Al-Arab districts, except for the post neonatal mortality rate where the highest rate was estimated in Al-Fao district. Al-Medainah, Basrah city center, and Al-Qurna, were found to have the lowest rates. Most of these infant/childhood deaths occurred in the neonatal period and especially in the first 7 days of life. Deaths from RDS and prematurity accounted for 46.5% of infant deaths, 57.2% of neonatal deaths and 64% of deaths within the first 7 days. Deaths in the late neonatal periods were attributed mainly to infectious causes. While deaths in the post neonatal period were mostly attributed to congenital anomalies and infectious diseases and (1-4 year) child mortality were mainly attributed to injuries. Improvement of environmental, social and economic conditions; special emphasis on antenatal care for mothers and neonatal care for babies especially for those born prematurely were some of the recommendations proposed to decrease infant/childhood mortality in Basrah governorate and in Iraq.

## INTRODUCTION AND LITERATURE REVIEW

### Definition

**The under-five mortality rate (U-5 MR)** is the number of Children who die by the age of five per 1000 live births per year. UNICEF classified under five mortality indicators into infant mortality rate and mortality rate for 1-4 years age children.<sup>(1)</sup>

**Infant mortality rate (IMR)** is the annual number of deaths of children under one year of age for every 1000 live births.<sup>(2)</sup> The infant mortality rate has two components the neonatal and post neonatal mortality rates.

**Neonatal mortality rate (NMR)** is the number of infant deaths under 28 days of age in a year per 1000 live births in the same year.<sup>(3)</sup>

**Post neonatal mortality rate (PNMR)** is the number of deaths of infants between 28 days and one year of life in a given year per 1000 live births.<sup>(3)</sup>

**Neonatal deaths may be subdivided into:**

**Early neonatal deaths**, occurring during the first seven days of life.

**Late neonatal deaths**, occurring after seventh day but before 28 completed days of life.<sup>(3)</sup>

**Children (1-4) years deaths** is the death of children aged 1-4 years (between exact of one year and the fifth birthday).<sup>(1)</sup>

**Live birth** is the complete expulsion or extraction from the mother of a product of human conception, irrespective of the duration of pregnancy, which after such expulsion or extraction, breathes or shows any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached.<sup>(4)</sup>

### Importance of under-Five Mortality as a Health Indicator

Measurement of children health is important for two reasons; first because young people are citizens in their own right, yet largely unable to act as self-advocates, particularly at the population level, and second because their health determines the health of the future population. Indicators based on measurements of children's health are important for identifying progress, problems, priorities and changes overtime.<sup>(5)</sup>

The under-five mortality rate is a leading indicator of the level of child health and over all development in countries it is also a millennium development goals indicator.<sup>(6)</sup> In an attempt to improve the state of global health, programs and initiatives have been launched to better diagnose, treat, control or even eradicate diseases and other health problems.. Infant mortality rate has long been considered as an important of indicator of nations' health and wellbeing.<sup>(8)</sup> The neonatal mortality rates also reflect the health status of mothers and give an idea about the quality of their health care. In 2011 the United States infant mortality rate ranked 27<sup>th</sup> among industrialized nations, behind most European countries Australia, Canada and South Korea. Sweden has the lowest infant mortality rate 1-2 per 1000 live births followed by Japan and Finland with infant mortality rate of 2.3 and 2.4 deaths per 1000 live births respectively.<sup>(10)</sup>

### Extent of under – Five Mortality

A declining time trend from 87 per 1000 live births in 1990 to 51 per 1000 live births in 2011 was reported for the under 5 year mortality across the world, 6.3 million children under the age of 5 died in 2013.<sup>(11,12)</sup>

The highest neonatal mortality rates occur in sub-Saharan Africa, followed by Asia and Latin America, in countries where the rate is highest, almost 10 percent of babies do not survive more than one month.<sup>(9)</sup>

Post neonatal mortality is reduced in many countries as a result of combination of improved living standards and interventions, such as immunization. Unfortunately the HIV epidemic in sub-Saharan Africa has reversed some of these gains in child survival.

**Table 1**

### Under five ,infant ,neonate mortality in selected countries for the year 2014

countries	Under 5 mortality neonate/1000 live birth	Infant mortality /1000 live birth	Neonate mortality /1000 live birth
Kuwait	9	8	2
Jordan	19	16	11
United Arab E.	7	6	4
Turkey	14	12	8
Iran	16	14	10
Pakistan	83	67	47
Sudan	72	49	30
Bahrain	7	6	2
Japan	3	2	1
United kingdom	4	4	3

*Source: References (13-15)*

### Causes of under-Five Child Mortality

Despite the substantial reduction in under five mortality during the last two decades, still millions of children aged less than five years die every year.<sup>(16)</sup> Acute lower respiratory tract infection mostly pneumonia, diarrhea, measles, and malaria are the leading causes of childhood deaths in developing countries. Under nutrition contribute to about 50% of these deaths.<sup>(17)</sup> Neonatal deaths generally result from complications of preterm birth, asphyxia or trauma during birth, infections, and congenital malformations.<sup>(9)</sup> Two thirds of under-five child mortality in the developing countries could be

prevented by simple, cost effective interventions.<sup>(7)</sup> Immunization and oral rehydration therapy for diarrhea could save many of these children, good nutrition is also needed, because malnutrition increases deaths from many of these diseases.<sup>(18)</sup>

### **Trends of under-Five Mortality**

Globally under five mortality has been roughly halved since 1990. A baby born today has a dramatically better chance of living to age five compared with one born at 1990. The worldwide under five mortality rate dropped 49 percent from 90 deaths per 1000 live births in 1990 to 45 in 2013, over the same period the total number of under five deaths in the world fell from 12.7 millions in 1990 to 6.7 millions in 2013.<sup>(12)</sup> Geographical distribution of childhood mortality in Iraq shows differences in infant and under-5 mortality rates between the three northern governorates and the south and center. Based on the 1999 UNICEF cross-sectional household survey, childhood mortality rate was reported to be 58/1,000 live births in Suleimaniya, 66/1000 live births in Erbil compared with 110 in Bagdad, while in Basrah and Thi-qar the rates were 138 and 158 respectively<sup>(19)</sup>.

### **The Study Objectives**

The main objectives of this study are:

- To estimate infant and under five child mortality.
- To study the distribution of these deaths according to selected socio demographic factors like sex and place of residence.
- To study causes of these deaths in Basrah.
- To put some recommendations for better care in the future which may reduce infant and childhood deaths in Basrah.

## **METHODOLOGY**

### **The Study Design**

This study is across sectional study, in which all death certificates at the statistics section in Basrah Directorate of health for the year 2014 were examined. Only deaths of children below the age of five years were studied. For each child all information regarding sex, age of the child at death, place of residence, cause and place of death were recorded.

### **Definition of Variables**

The following is a list of some variables, which were covered for every under five year child in this study as well as their classification.

- **Sex of the child: male/female**
- **Age of the child at death:** This was classified according to the following age periods for analysis.
  - early neonatal (birth-7days).
  - late neonatal (8-28days).
  - post neonatal (29 days-less than a year).

- child deaths: 1-4 years.
- **cause of death:** Causes of children's deaths were grouped as the following :
  - Respiratory diseases mainly pneumonia, Septicemia, Prematurity, Respiratory distress syndrome, Jaundice
  - Congenital anomalies, Accidents, Birth asphyxia, Meningitis & encephalitis, Malnutrition, Diarrhoeal diseases, Malignancies, Infectious diseases, Cerebral palsy (or its complications), Multiple causes (a combination of two or more of the above causes), Acute renal failure, and Other causes.

### Data Analysis

The Statistical Package for Social Sciences (SPSS) version 20 was used for statistical analysis. Chi square test was used to identify the association between mortality and a selected variable taking  $p < 0.05$  as a conventional level of "significance".

## RESULTS

### Under - Five Mortality

A total of 106779 live births were registered in Basrah for the year 2014. A total of 11372 deaths were registered during the same year, of these 2619 were deaths among children under five years of age representing 23% of the total deaths for that year. Overall 2279 (21.3 %) of deaths of children were among infants, and 340 were deaths among children aged 1-4 years. Of those who died during infancy, 1786 died in the neonatal period and 493 in the post neonatal period, with 1452 (13.5%) of neonatal deaths took place in the first week of life. Thus the under-five and infant mortality rates were 24.5 and 21.3 per 1000 live births respectively. The neonatal mortality rate was 16.7 per 1000 live births (early neonatal mortality rate was 13.5 and late neonatal mortality rate was 3.1 per 1000 live births). While post neonatal mortality and 1-4 year childhood mortality rates were 4.6 and 3.1 per 1000 live births respectively.

### Infant Mortality

#### Infant Mortality by Sex

Of the 106779 live births registered in Basrah at 2014, 54747 (51.2%) were males and 52032 (48.7%) were females. The distribution of infant, neonatal and post neonatal mortality rates by child's sex is shown in Table (2). As it can be seen from the table, there were clear differences between the two sexes in their mortality rates for the whole first year. Mortality rates for males exceeded that for females, the differences in infant and neonatal mortality rates between the two sexes were statistically highly significant, while the difference between both sexes in the post neonatal rate was not statistically significant.

**Table 1: The Under – Five Mortality Rates  
(Basrah, 2014)**

Category	Number of Deaths	Rate/1000livebirths
Under- Five children	2619	24.5
Infant	2279	21.3
Neonatal	1786	16.7
Early neonatal	1452	13.5
Late neonatal	334	3.1
Post neonatal	493	4.6
Child (1-4 year)	340	3.1

**Table 2: Distribution of Infant Mortality by Sex (Basrah, 2014)**

Sex	Live Births	Neonatal Deaths	NMR/ 1000L.B	Post - Neonatal Deaths	PNMR/ 1000L.B	Infant Deaths	IMR/ 1000L.B
Male	54747	1027	18.7	261	4.7	1288	23.5
Female	52032	759	14.5	232	4.4	991	19
<b>Total</b>	<b>106779</b>	<b>1786</b>	<b>16.7</b>	<b>493</b>	<b>4.6</b>	<b>2279</b>	<b>21.3</b>

 $\chi^2=28.231$  $\chi^2=0.553$  $\chi^2=25.639$ 

P&lt;0.001

P&gt; 0.05

P&lt;0.001

**Infant Mortality Distribution by Place of Residence**

In the present study, infant mortality rates varied by place of residence. The highest infant mortality rates were found in Shat- Al- Arab, Al- Hartha and in Al-Fao, infant mortality rates were 51.3, 50.2 and 32.8 respectively (all per 1000 live births). The lowest infant mortality rate was found in Al- Medainah (10.3 per 1000 L.B) followed by Al- Qurna and Basrah city at 19.2/1000 L.B and 20.1/1000 L.B. respectively. Similar differences were noted with regard to neonatal mortality rates. In all areas neonatal mortality rate exceeded post neonatal mortality rate, table (3) shows the distribution of infant mortality by place residence. The differences in infant mortality between areas were highly significant.

**Table 3: Infant Mortality Distribution by Place of Residence (Basrah, 2014)**

Area	Live Births	Neonatal Deaths	NMR	Post Neonatal Deaths	PNMR	Infant Deaths	IMR
Shat-Al-Arab	1518	64	42.2	14	9.2	78	51.3
Al-Hartha	1811	69	38.1	22	12.1	91	50.2
Al-Fao	670	12	17.9	10	14.9	22	32.8
Abu-Alkhasib	3812	85	22.2	19	4.9	104	27.2
Al- Zubair	11374	200	17.6	94	8.2	294	25.8
Basrah city	70299	1149	16.3	267	3.7	1416	20.1
Al- Medainah	6638	51	7.7	18	2.7	69	10.3
Al-Qurna	10657	156	14.6	49	4.5	205	19.2
<b>Total</b>	<b>106779</b>	<b>1786</b>	<b>16.7</b>	<b>493</b>	<b>4.6</b>	<b>2279</b>	<b>21.3</b>

 $\chi^2=156.581$  $\chi^2=93.39$  $\chi^2=551.395$ 

P&lt;0.001

P&lt; 0.001

P&lt;0.001

**Causes of Infant Mortality**

Table (4) shows the causes of infant deaths. As can be seen, RDS was the commonest cause of infant deaths, it constituted (30.1%), followed by congenital anomalies (16.7%), prematurity (16.4%), septicemia (13.8%), pneumonia (6%), birth asphyxia (5.3 %), accidents (5.2%), jaundice (1.2%), cerebral palsy(0.9%), meningitis and encephalitis 0.8%, diarrhea 0.7%, malnutrition 0.4% of these deaths, 1.5% of infant deaths had resulted from a combination of two or more of the above mentioned causes, and 0.9 % were attributed to other causes, mainly intestinal obstruction, hematological diseases and myocarditis.

**Neonatal Mortality****Neonatal Mortality by Sex**

Table (5) shows the distribution of neonatal (early and late neonatal mortality) by child's sex. As can be seen from the table neonatal mortality was higher among males than among females.

**Table 4: Causes of Infant Mortality  
(Basrah, 2014)**

Cause	Number	Percent
RDS	686	30.1
Congenital anomalies	381	16.7
Prematurity	374	16.4
Septicemia	315	13.8
Pneumonia	137	6.1
Birth asphyxia	123	5.3
Accidents	118	5.2
Jaundice	27	1.2
Cerebral palsy	20	0.9
Meningitis & encephalitis	17	0.8
Diarrhea	15	0.7
Malnutrition	10	0.4
Multiple causes	35	1.5
Others	21	0.9
<b>Total</b>	<b>2279</b>	<b>100</b>

**Table 5: Distribution of Neonatal Mortality by Sex  
(Basrah, 2004)**

Sex	Live Births	Early N.D	Early NMR	Late N.D	Late NMR	Neonatal Deaths	NMR
Male	54747	845	15.4	182	3.3	1027	18.7
Female	52032	607	11.6	152	2.9	759	14.5
<b>Total</b>	<b>106779</b>	<b>1452</b>	<b>13.6</b>	<b>334</b>	<b>3.1</b>	<b>1786</b>	<b>16.7</b>

 $X^2=28.249$        $X^2=1.39$        $X^2=28.231$ 
 $P<0.001$        $P>0.05$        $P<0.001$ 

The association between neonatal mortality and child's sex was highly significant; early neonatal mortality was highly significantly associated with child's sex, while late neonatal mortality was not significantly associated.

#### Neonatal Mortality by Place of Residence

Table (6) shows the distribution of neonatal mortality (early & late neonatal mortality) by place of residence. It is evident from the table that neonatal mortality rates varied greatly by area of residence, the highest rate was found in Shat-Al- Arab (42.2/1000 L.B) while the lowest rate was in Al- Medainah (7.6/1000L.B), therefore an infant in Shat Al- arab was five times more likely to die in the first month of life than an infant in Al- Medainah. In all areas the early neonatal mortality rate was markedly higher than the late neonatal mortality rate.

**Table 6: Neonatal Mortality by Place of Residence (Basrah, 2014)  
(Basrah, 2014)**

Area	Live Births	Early N.D	Early NMR	Late N.D	Late NMR	Neonatal Deaths	NMR
Shat- Al- Arab	1518	58	38.2	6	3.9	64	42.2
Al- Hartha	1811	54	29.8	15	8.2	69	38.1
Abu-Al-Khasib	3812	68	17.8	17	4.4	85	22.2
Al- Zubair	11374	158	13.8	42	3.6	200	17.5
Al- Fao	670	9	13.4	3	4.4	12	17.9
Basrah city	70299	936	13.3	213	3	1149	16.3
Al- Qurna	6638	129	19.4	27	4	156	14.6
Al-Medainah	10657	40	3.7	11	1	51	7.6
<b>Total</b>	<b>106779</b>	<b>1452</b>	<b>13.6</b>	<b>334</b>	<b>3.1</b>	<b>1786</b>	<b>16.7</b>



### Causes of Neonatal Mortality

It is evident from table (7) that RDS was the first leading cause in the first week of life accounted for (39.9%) of early neonatal deaths, prematurity was the second leading cause (24.1%), followed by congenital anomalies (14.2%), birth asphyxia (8.5%), septicemia (6.7%), accidents (1.5%), jaundice (1.5%), pneumonia (0.9%), cerebral palsy (0.1%), meningitis and encephalitis (0.1%), (2.2%) of early neonatal deaths were resulted from more than one cause, and 0.3 % were the result of other causes. Therefore, RDS and prematurity together accounted for 64%, more than a half of registered first week neonatal deaths. The commonest cause of death in the late neonatal period was septicemia accounted for (36.2%), followed by RDS (21.3%), congenital anomalies (15.9%), pneumonia (11.1%), prematurity (6.6%), accidents (5.1%), jaundice (1.2%), meningitis and encephalitis (0.9%), and 0.8% were the result of other causes.

**Table 7: Causes of Neonatal Mortality**

Causes	Early Neonatal Deaths		Late Neonatal Deaths		Total	
	Number	%	Number	%	Number	%
RDS	579	39.9	71	21.3	650	36.4
prematurity	350	24.1	22	6.6	372	20.8
congenital anomalies	206	14.2	53	15.9	259	14.5
Birth asphyxia	123	8.5			123	6.9
septicemia	97	6.7	121	36.2	218	12.2
accident	22	1.5	17	5.1	39	2.2
jaundice	21	1.5	4	1.2	25	1.4
pneumonia	13	0.9	37	11.1	50	2.8
Cerebral palsy	2	0.1	2	0.6	4	0.2
Meningitis & encephalitis	2	0.1	3	0.9	5	0.3
Diarrhea	0	0	1	0.3	1	0.1
multiple causes	32	2.2			32	1.8
others	5	0.3	3	0.8	8	0.4
<b>Total</b>	<b>1452</b>	<b>100</b>	<b>334</b>	<b>100</b>	<b>1786</b>	<b>100</b>

### Post Neonatal Mortality

#### Post Neonatal Mortality by Sex

Table (8) shows the distribution of post-neonatal mortality by sex. As it can be seen from the table the post neonatal mortality rate for males was higher than that for females. Post neonatal mortality was not significantly associated with child's sex.

**Table 8: Post Neonatal Mortality by Child's Sex (Basrah, 2014)**

Sex	Live births	Post Neonatal Deaths	PNMR / 1000 L.B
Male	54747	261	4.7
Female	52032	232	4.4
<b>Total</b>	<b>106779</b>	<b>493</b>	<b>4.6</b>

$$X^2=0.553 \quad P>0.05$$

#### Post Neonatal Mortality Distribution by Place of Residence

Post neonatal mortality rate varied greatly by place of residence. The highest rate was found in Al- Fao (14.9/1000L.B) and AL-Hartha (12.1/1000 L.B), while the lowest mortality rates were found in Al-Medianah and the city center at 2.7 and 3.7 per 1000 L.B respectively. Thus an infant in Al- Fao was five and four times more likely to die in the post neonatal period than an infant in Al- Medianha and Basrah city respectively. Table (9) shows the distribution of post

neonatal mortality by place of residence. The differences in the post neonatal mortality between areas were highly significant.

**Table 9: Distribution of Post Neonatal Mortality by Place of Residence (Basrah, 2014)**

Area	Live Births	Post Neonatal Deaths	PNMR/1000L.B
Al- Fao	670	10	14.9
Shat - Al -arab	1518	14	9.2
Al- Zubair	11374	94	8.2
Abu- Al - Khasib	3812	19	4.9
Al- Hartha	1811	22	12.1
Al- Medainah	6638	18	2.7
Basrah city	70299	267	3.7
Al- Qurna	10657	49	4.5
<b>Total</b>	<b>106779</b>	<b>493</b>	<b>4.6</b>

$X^2=93.39$

$P<0.001$

### Causes of Post Neonatal Mortality

The post neonatal infant deaths in the present study were attributed to the following causes, congenital anomalies which accounted for (24.8 %), septicemia (19.7%), pneumonia (17.7%), accidents (16%), R.D.S (7.3%), cerebral palsy (3.3%), diarrhea (2.8%), meningitis & encephalitis (2.4%), malnutrition (2%), prematurity (0.4%), jaundice (0.4%), and (0.6%) of these deaths were attributed to more than one cause, while (2.6%) of deaths were due to other causes mainly intestinal obstruction, anemia and other bleeding disorders, asthma and sudden death.

### Child (1-4 Year) Mortality

#### Child (1-4 Year) Mortality Distribution by Child's Sex

Table (11) shows the distribution of mortality among children aged (1-4 years) by child's sex. The male mortality rate was 3.4/1000L.B, while female mortality rate was 2.9 /1000 L.B.

**Table 10: Causes of Post Neonatal Morality (Basrah, 2014)**

Cause	Number	Percent
Congenital anomalies	122	24.8
Septicemia	97	19.7
Pneumonia	87	17.7
Accidents	79	16
RDS	36	7.3
Cerebral palsy	16	3.3
Diarrhea	14	2.8
Meningitis& encephalitis	12	2.4
Malnutrition	10	2
Jaundice	2	0.4
Prematurity	2	0.4
More than one	3	0.6
Others	13	2.6
<b>Total</b>	<b>493</b>	<b>100</b>

**Table 11: Distribution of Child (1-4 year) Mortality by Sex (Basrah, 2014)**

Sex	Live Births	Child (1-4y) Deaths	Child(1-4y) MR/1000L.B
Male	54747	187	3.4
Female	52032	153	2.9
<b>Total</b>	<b>106779</b>	<b>340</b>	<b>3.1</b>

$$X^2=1.898 \quad P>0.05$$

### Child (1-4 Year) Mortality by Place of Residence

Table(12) shows the distribution of (1-4year) child mortality by place of residence. The highest rate was found in Al –Hartha 11.5/1000 LB and Al-Fao 10.4/1000 LB, the lowest one was found in Al- Medainah (1.5/1000 L.B) . The risk of death in this age group in the area with the highest mortality relative to that in the area with the lowest rate was 7 folds higher. There was highly significant association between 1-4 year child mortality and area of residence.

### Causes of Child Mortality

Table (13) shows that the commonest cause of 1-4 year child mortality was accidents, it constituted (39.7%), the second commonest cause was congenital anomalies (14.7), pneumonia (13.2 %) of total deaths occurred among this age group. Other causes were cerebral palsy (9.4%), malignancy (7%), septicemia (6.2%), meningitis and encephalitis (2.7%), malnutrition (1.5%), acute renal failure (1.2%) jaundice (0.6%), and the remaining (0.5 %) of these deaths were attributed to a combination of more than one of the above causes, and 3.2% of the causes were attributed to causes other than these causes mainly intestinal obstruction, asthma, anemia, sudden death.

**Table 12: Distribution of Child Mortality by Place of Residence (Basrah, 2014)**

Area	Live Births	Children (1-4year) Deaths	Child MR/ 1000L.B
Shat- Al-arab	1518	6	3.9
Al- Hartha	1811	21	11.5
Al- Zubair	11374	51	4.4
Abu- Al-Khasib	3812	29	7.6
Basrah city	70299	183	2.6
Al-Fao	670	7	10.4
Al- Qurna	10657	33	3
Al- Medainah	6638	10	1.5
<b>Total</b>	<b>106779</b>	<b>340</b>	<b>3.1</b>

$$X^2=94.732 \quad P<0.001$$

**Table 13: Causes of (1-4year) Child Mortality (Basrah, 2014)**

Causes	Number	Percent
Accidents	135	39.7
Congenital anomalies	50	14.7
Pneumonia	45	13.2
Cerebral palsy	32	9.4
Malignancies	24	7.0
Septicemia	21	6.2
Meningitis&encephalitis	9	2.7
Malnutrition	5	1.5
Acute renal failure	4	1.2
Jaundice	2	0.6
More than one cause	2	0.6
Others	11	3.2
<b>Total</b>	<b>340</b>	<b>100</b>

## DISCUSSIONS

### Under-Five Child Mortality

Children are the future of every nation, a study of infant and childhood mortality is important because they are the leading indicators of the level of child health. Mortality usually reflects community's major health problems. Understanding the epidemiology of mortality in a community makes the planning, organization of effective health care delivery system, setting priorities and implementation of effective health care programs most in need of that community easier & more successful.<sup>(20)</sup> In the present study the overall under five and infant mortality rates were 24.5 and 21.3 /1000 live births respectively. These rates are higher than those reported for the neighboring countries ( Iran, Turkey, and Jordan), and they are many times higher than those reported in the Gulf countries ( Kuwait, United Arab Emirates and Bahrain), while they are very much lower than those reported for Pakistan and Sudan.<sup>(13,14,15)</sup> A household study on infant mortality carried out in two areas in Basrah (Hay Al- Hussein & Hay- Al- Jazzier) for the period 1985 – 1989 the overall IMR was 41.7/1000 L.B, which was higher than those reported for Basrah and the whole country at 32.2 and 26.1/1000 L.B respectively in the same period<sup>(21)</sup>. A cross sectional study based on death certificates was carried out to study under five mortality in Basrah at 2004, the under-five mortality and infant mortality were 27.3 and 24 per 1000 live births respectively<sup>(22)</sup>. Descriptive retrospective study carried out in Basrah for the period from 2008-2013 depending on the data obtained from statistical unit of Basrah directorate of health, infant mortality rate was 22.4/1000 L.B<sup>(23)</sup>. In Bangaladish under five mortality rate was 44 per 1000 live births at 2011<sup>(24)</sup>. In the present study neonatal mortality constituted 78.3% of infant deaths. Infants were 3 times more likely to die in the neonatal period, as compared to the post neonatal period. Neonatal mortality rate in the present study as compared. In the house hold study (1985-1989), the contribution of neonatal & post neonatal mortality to infant deaths was similar, the neonatal mortality rate was 21 higher than that reported by the present study which is 16.7, and the post neonatal mortality rate was 20.7 about five times higher than the present one (all per 1000 live births). The difference in IMR between the present study and the household study may be attributed to the way by which both studies were implemented, the first based on information gathered directly from mothers through a household survey, while the other one derived its information from the records which may be incomplete. Furthermore the results of the present study represent mortality for the whole governorate, both urban and rural populations, while the previous household study was limited to two urban areas.

### Child's Sex Affecting Mortality Rates

It is clear from this study that infant and child mortality rates for males were higher than those estimated for females. Similarly all other estimated mortality rates in the present study showed differences between the two sexes, all rates were higher in males as compared to females. In the household study (1985-1989), no difference was found in the infant mortality rates between the two sexes, also there is clear difference in all mortality rates estimated for the year 2004<sup>(22)</sup>. In the United States at 2000, IMR was also higher for male infants,<sup>(25)</sup> in Iran a study find that deaths of under-five males constituted 52% of all deaths among this age group as compared to 48% for females<sup>(26)</sup>.

### Mortality by Place of Residence

In the present study there were marked differences in mortality rates between different areas in Basrah. A child in an area with the highest IMR is five times more likely to die in the first year of life as compared to a child living in the lowest IMR area, and he is eight times more likely to die after his first birthday and before reaching his fifth one. Similar

difference was noted with regard to neonatal mortality rates, in all areas neonatal mortality rate exceeded post neonatal mortality. The same inequalities by place of residence were marked in the 1-4 years child mortality rates. The differences noticed between areas may be resulted from differences in demographic, socio economic, educational and environmental pattern between these areas, or due to differences in completeness of registration. In the household study at the eighties, there was a marked difference in the IMRs between the two areas in Al- Basrah city (Hay Al- Hussein & Al –Jazzier), the rates were 47.2/1000 L.B and 18.8 per 1000 L.B in the two areas respectively. The researcher attributed these differences to the fact that infants in Hay- Al- Hussein were born to a teenage or older mother and more likely to be a later born infants than those born in Al- Jazzier<sup>(21)</sup>. In the cross sectional study of under-five mortality rate in Basrah at 2004, there were marked differences between different areas in Basrah, the highest infant and under five mortality rates were observed in Shat Al-Arab and Al-Hartha, while the lowest under five mortality rates were observed in Al-Qurna and the City Center, the lowest IMRs were found in Al-Qurna and Al-Medainah distinct. <sup>(22)</sup>

### Causes of Infant & Child Mortality

The leading causes of infant deaths in the present study were: R.D.S, congenital anomalies, prematurity, septicemia, pneumonia, birth asphyxia, and accidents. In the cross sectional study at 2004 of under five mortality 2004, the leading causes of infant deaths were: Prematurity, septicemia, respiratory distress syndrome, pneumonia, and congenital anomalies. While in the eighties survey, infants died mostly from gastroenteritis, prematurity, asphyxia and trauma at birth, jaundice and respiratory diseases.<sup>(21)</sup> With respect to the causes of deaths among 1-4 years age category in the present study, the leading causes were accidents, congenital anomalies, pneumonia and cerebral palsy. In 2004 study the leading causes were: accidents, gastroenteritis, pneumonia, congenital anomalies, and malnutrition.<sup>(22)</sup> In Africa the most common causes of mortality in children under five years were: pneumonia, diarrhea, and malaria.<sup>(27)</sup>

## CONCLUSIONS & RECOMMENDATIONS

### CONCLUSIONS

From this study the following were obtained:

- The estimated under five mortality rate for the year 2014 in Basrah was 24.5/1000L.B, IMR was 21.3/1000 L.B, with a neonatal post-neonatal mortality rates of 16.7 and 4.6 per 1000 L.B respectively.
- Almost 87% of deaths among under five children occurred in the first year of life, among those who died in the first year of life, over 78% died in the first month of life, 81% of which died in the first week of life. Neonatal deaths and especially early neonatal deaths represented a larger proportion of the overall total IMR, an indication that the intrapartum period and life the first 7 days of life are the most critical periods of infant survival.
- All the estimated mortality rates were higher for males as compared to females.
- Marked geographical inequalities were observed for infant and child deaths, mortality rates varied greatly by place of residence.
- R.D.S and Prematurity were the main causes of neonatal deaths, while most of post-neonatal deaths were attributed to congenital anomalies and infectious causes. The majority of deaths occurred among 1-4 years children were attributed to accidents.

## RECOMMENDATIONS

To improve infant, and under five mortality rates in Basrah and in Iraq, the following recommendations are suggested. Generally most of the suggested recommendations are simple, easy to implement and are cost – effective.

- Improvement of environmental, social and economic conditions as well as improving sanitary facilities, which have great deal in affecting infant's survival by promoting healthy life style. Wide inequalities in childhood mortality between different areas, can also be narrowed by improvement of these conditions.
- Education of the women about the importance of antenatal care, mothers should be encouraged to utilize the health care services because early and regular antenatal care helps in early detection of the complications that may arise in pregnancy and during labour and to plan for safe delivery.
- Promotion of low cost methods for provision of essential health care services, which should be easily accessible. Health centers should be well equipped by all the necessary drugs and supplies to meet the community's needs, ensuring that these services are reaching the poorest population and are available nearby their houses.
- Family health education; parents should be educated how to take care for their children and to participate in their health care, they should be provided with knowledge about how to deal with their illnesses and to differentiate the danger signs of the most important illnesses, learning about the safety measures that should be taken to keep their children away from danger, and to avoid home care practices and unsafe home remedies. Mass media such as T.V, radio and magazines should be actively involved in sending health education messages. Also the use of visual aids such as posters may be of benefit.
- Pregnant women should be encouraged to deliver either in the hospital or by a qualified well-trained person.
- Improvement of the labour facilities at the hospital including more sterile instruments to reduce infection. In addition to the improvement of the midwifery facilities and midwives should be followed and trained regularly and to be sure that they have all the necessary supplies and equipment.
- Mothers should be encouraged to exclusively breast feed their babies, mothers should learn about the importance of prompt and exclusive breast feeding in providing essential nutrients and in the protection against infections in addition to its role as a family planning method.
- Improvement of the neonatal care services and neonatal intensive care. Premature babies should be provided by a special care in "a premature care unit" to deliver an extra care for those preterm born babies; warming, adequate nutrition, and early detection and treatment of infections.
- Family planning should be encouraged; mothers should know the importance of family planning services for proper spacing between pregnancies and to limit the number of their children, which will provide them with the opportunity to give better care for their smaller families.
- To have proper and better statistic, the registration system should be improved. Doctors must properly fill the death certificates with complete information. The cause of death should be accurately recorded (the immediate and the underlying causes).

- Improvement of the health care system, to be well coordinated, with well-trained health care workers and medical technicians, and workers are diverted into high profile programs of screening and treatment for the commonly diagnosed conditions.

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## APPENDIX

### LIST OF ABBREVIATIONS

WHO	World Health Organization
HIV	Human Immunodeficiency Virus
AIDS	Acquired Immune Deficiency Syndrome
IMR	Infant Mortality Rate
LB	Live Birth
NMR	Neonatal Mortality Rate
PNMR	Post Neonatal Mortality Rate
ND	Neonatal Death
RDS	Respiratory Distress Syndrome